NOTES ON THE LIFE-HISTORIES OF SOME VICTORIAN LYCAENID BUTTERFLIES.

By L. B. THORN.

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BEFORE dealing directly with the Lycaenid butterflies, the subject of my paper, it may perhaps be advantageous to some of those present to have a few of the main facts in the life-history of a butterfly put before them.

Butterflies and moths belong to the Order **Lepidoptera** or insects having wings clothed with scales. This order is divided into two sections, the first being called the **Rhopalocera** or club-horned antennae; butterflies belonging to this section. The majority of our butterflies are day-fliers, and like the bright sunshine. A few species in Queensland and northern New South Wales fly in the evening, just before dusk. When at rest the wings of a butterfly are usually held erect above the back, with the upper surfaces pressed closely together. The second section is called the **Heterocera** or insects with broad feathery or fine thread-like antennæ. Moths belong to this section, and, as a rule, fly after sunset, and have the above type of antennæ. The wings of a resting moth are nearly always seen folded along the back, or flat against the surface on which they rest.

Butterflies and moths are among the giants of the insect world. They can be defined as insects with two pairs of membranous wings well adapted for extended flight, and clothed with scales overlapping each other like the slates on the roof of a house, flattened and rounded on the surface of the wings, but more or less hair-like upon the body. The head is usually provided with a tubular proboscis that can be curled up like a watch spring when at rest, and, when extended, is admirably adapted for sucking up the honey from flowers. Typical butterflies are usually slender-bodied insects with delicate legs and richly-tinted wings; they fly about in bright sunlight, visiting flowers and feasting upon the nectar that they find in the blooms. They have large compound eyes, so that they can see very well; and the slender, tubular mouth is very highly developed in all butterflies.

This evening I am dealing with nine species of our Victorian Lycaenid butterflies, of which I have specimens on exhibition, with, in some cases, complete life-histories. My notes on the species are the result of observations made in the field, and by breeding out some of the species. The localities where the larvae, pupae, and perfect insects have been taken will also be given. All these beautiful butterflies exhibited belong to the family Lycaenidae, which is divided into two sub-families,

Ogyrinae, Theclinae, and four genera—Ogyris, Miletus, Ialmenus, and Protialmenus.

The first stage in the life-history of a butterfly is the ovum, or egg; the second the larva, or caterpillar; the third the pupa or chrysalis; and, lastly, the imago, or perfect butterfly. The eggs of Lycaenid butterflies are smooth, and almost spherical; sometimes smooth and much flattened at base and apex, sometimes densely pitted and flattened. They are deposited either singly or in clusters upon the stems, young shoots, or flower-buds of the food plant. The caterpillar is composed of thirteen segments or rings, the first one being the head. They have sixteen legs, the first six being the true legs, which reappear in the perfect insect, while the other ten are termed pro-legs, or claspers, which are used for holding on to the food plant while the caterpillar is feeding, and are entirely lost when the change into a chrysalis takes place. The Lycaenid larva or caterpillar is almost invariably flattened and slug-like in shape, with the head concealed while at rest. The posterior segments usually possess dorsal glands, which secrete a liquid much prized by ants. The ants, consequently, attend the larvae and shepherd them. Some of these caterpillars feed during the day, others at night, sheltering during the daylight in ants' nests, under loose bark or stones, in curled leaves or flower-buds, or in crevices of the trunk of the food-plant. The chrysalis is usually smooth, and in transverse section ovoid, sometimes much flattened, and with the abdomen extended in lateral ridges. It is usually attached by the tail, and sometimes by a central silken girdle-thread in either horizontal or vertical position, and with the head either upwards or downwards. It is generally found in the same position as the sheltering larvae, more rarely loose just beneath the surface of sandy soil. The perfect butterfly is usually of a small size and delicate structure, with beautiful rich colours of blue, purple, green, and copper. All the legs are developed for walking, but the front pair less so than the others, and are better developed in the female than in the male. These four stages in some of the species exhibited take a year to complete; with other species there are generally two broods in a season—the spring and autumn.

The first three species of butterflies shown belong to the sub-family **Ogyrinae,** genus **Ogyris.** The caterpillars of these three species of butterflies feed on mistletoe, which is nearly always found high up on encalypts and other trees. Consequently, the butterflies are nearly always seen flying high up over the top of the trees and around the mistletoe, with the result that they are difficult to capture on the wing; hence the best way to secure good specimens is to find the larvae or pupae and breed out the perfect insects.

My first species is the Common Mistletoe Blue, **Ogyris olane,** Hewitson, exhibited with the four stages in its life-history—viz., eggs, inflated caterpillar, chrysalis, and perfect insects of both sexes (see fig. 1). The food plant of this species is the Drooping Mistletoe, *Loranthus pendulus*, which is found on eucalypts. The caterpillars are night feeders, hiding under loose bark on the trees during the day. Sometimes I have found the larvae and pupae, with two species of ants, on the same tree, but they are more often found without ants attending them. When full grown a number of caterpillars crawl down the tree to pupate under bark, which is generally found loose near the base of the trees. It is interesting to note that the pupae, when exposed to a strong light, make a faint clicking sound. I remember the first time I brought home several pupae, and while transferring them into the breeding box, under a strong electric light, to my surprise one after another made this sound, and I found that by placing the pupae in a tin the sound was more clearly defined. There are two broods in a season of this beautiful butterfly. In the spring the caterpillars are found in various stages from June to September. The perfect insects being on the wing during the end of September and throughout October and November. The autumn brood is on the wing in the months of January, February, and March. The majority of the insects emerging from this latter brood in the breeding box were females. Last season I made a note of how long it took this butterfly to emerge from the chrysalis. A full-grown caterpillar was secured on the Mooroodue excursion, 20th October, 1923; the caterpillar turned into a chrysalis on the 27th October, and the perfect female, which is shown, emerged 6th December, thus taking forty days for the butterfly to emerge. The central area on the wings of the male butterfly is dull purple; on the wings of the female bluish-purple. The localities where the larvae and pupae have been secured are Frankston, Eltham, Macedon, Bendigo, and along the Ferntree Gully-road.

The second species is the scarce Mistletoe Blue, **Ogyris abrota,** Westwood, of which I exhibit two stages in the life-history—the pupa and perfect insects of both sexes. The food plant of this species is the common Mistletoe, *Loranthus celastroides*, which is found principally on eucalypts. The caterpillars are night feeders, hiding under loose bark on the trees during the day. They are attended by a number of small black ants of the genus Crematogaster. This ant has a heart-shaped abdomen, and when disturbed raises the abdomen and moves slowly around and about the caterpillar and chrysalis. This butterfly is becoming very scarce in Victoria. It is a rather local butterfly, and generally found in numbers

where it occurs. While on a visit to Broadmeadows with Mr. A. N. Burns, in 1922, we noticed a couple of Meat Ants, *Iridomyrmex detectus*, coming down a tree with two young larvae of this butterfly between their mandibles. After catching the ants we found that both the caterpillars were dead, and very nearly bitten in two. There was one eucalypt tree bearing the Common Mistletoe that was free from this ant and on which I was always sure of finding a caterpillar or chrysalis every season. This year I paid a visit to the tree and found that the Meat Ants had invaded the tree, with the result that my search for a larva or pupa proved fruitless. It seems strange that this large ant kills the larvae of this pretty butterfly, as these same ants attend with great care caterpillars of the Imperial Blue Butterfly, and will always attack you if the larvae or pupae are disturbed. In the spring brood the larvae and pupae are found in the months of July to October; perfect insects are on the wing in the months of October and November. In the autumn brood the butterflies are on the wing in February and March, a large number of female butterflies emerging in this latter brood. The central area on the wings of the male butterfly is rich dark purple; the forewings of the female are brown-black, with the central area light yellow. Localities where larvae and pupae have been collected are Broadmeadows and the You Yangs. W. H. A. Roger secured larvae and pupae at Black Rock and Springvale.

My third species is the Satin Blue, **Ogyris amaryllis meridionalis,** Bethune-Baker. The food plant of this species is the Slender Mistletoe, *Loranthus linophyllus*, which is found on Sheoke trees in the north-west of Victoria. F. E. Wilson captured the specimens exhibited in the Mallee during September, 1917. The wings of the male butterfly are metallic blue; of the female, metallic blue tinged with purple.

The next three species belong to the genus Miletus. The butterflies of this genus are noted for their beautiful metallic colours on the upper surface of the wings and also by the rich metallic markings on the under surface of the wings.

The fourth species is the Moonlight Blue, **Miletus delicia delos,** of which I have the four stages—the eggs, inflated larvae, pupae, and perfect insects of both sexes (see fig. 2). The central area on the wings of the male butterfly is metallic green, of the female metallic blue. This species is one of our most beautiful butterflies, and is very rarely seen on the wing. This year, for the first time, I found a specimen of this butterfly on the wing. It was walking over the flowers of the Sweet Bursaria, *Bursaria spinosa*, feasting on the nectar with the wings held erect above the back, with the upper surfaces pressed closely

together. The caterpillars of this butterfly are night feeders, hiding under loose bark, also in holes in the tree made by the boring beetles and wood-moth caterpillars. One of the inflated caterpillars shown to-night was found on a Black Wattle, *Acacia mollissima*; the other on a Blackwood, *Acacia melanoxylon*. They are always attended by a number of small black ants of the genus Crematogaster. This ant has a heart-shaped abdomen, and when disturbed raises the abdomen and moves slowly around and about the larvae. The attendance by ants is due to the fact that the larvae secrete a liquid from two glands situated at the posterior end of the body. The ants are also a protection for the caterpillars from parasites, which kill a large number of other species of butterfly caterpillars that are not attended by ants, and also a great number of moth caterpillars, every season. The Moonlight Blue Butterfly larvae are found from the end of January to the middle of November. I have had them feeding for nine months in the breeding-box. From February to April the larvae would come out at dusk from under a piece of blotting paper pinned in the corner of the box and crawl on to their food plant, placed in a bottle of water. From the end of May to July the larvae appear to semi-hibernate or eat very little of their food plant. During August, September, and October the caterpillars seem to be very hungry, and make up for the two months they hibernated—in fact, every week I noticed a difference in the size of the larvae. I used to place small pieces of apple on the food plant. The caterpillars seem to prefer the apple first before going on to the Acacia to feed. I also gave the ants bread soaked in water. If the ants were not in the breeding box to attend the larvae the secreted liquid would form into a mould or mildew, which kills a number of species of Lycaenid larvae every season. This white mildew develops on the eleventh and twelfth segments, situated at the posterior end of the body. Once this mildew forms on the caterpillar it generally keeps in the same position for a week, and gradually shrinks to nearly half its original size, becoming hard and rigid. When full grown the caterpillars attached themselves to the breeding-box with a silken pad at the tip of the abdomen, and also by a central silken girdle-thread. They turned into a brown chrysalis, which gradually became black a week before the butterfly emerged. There is only one brood of this lovely butterfly during the season, the perfect insects being on the wing in the months of December and January. Localities where the larvae and pupae were secured, Dandenong and Woori Yallock. W. H. A. Roger, while collecting at Springvale, found a number of pupae of this butterfly in a roll of loose bark, which was on the ground near the base of a Black Wattle, a number

of ants mentioned being inside the roll of bark with the pupae.

The fifth species is **Miletus ignita,** Leach. The caterpillars of this butterfly feed on the Golden Wattle, *Acacia pycnantha.* H. W. Davey, while collecting ant-nest beetles at Ocean Grove, found a number of caterpillars and pupae of this butterfly. They were attended by a number of small ants, not identified. The caterpillars were found hiding under the roots and curved trunk of the young Golden Wattles, and came out to feed at night. The pupae are found in the same position as the sheltering caterpillars throughout October and November. The butterflies are on the wing in November and December. The central area on the wings of the male butterfly is dull coppery-purple; on the wings of the female, purple tinged blue.

My sixth species, **Miletus hecalius,** Miskin, has been captured on the wing near Sherbrook Falls, Belgrave. A. N. Burns secured a number of pupae at Como, New South Wales, and forwarded four to me, from which three butterflies emerged, a pair of them being exhibited this evening. The central area on the wings of the male is rich purple; on the forewings of the female there is a central patch of orange.

The next two species belong to the genus Ialmenus. Seventh species, the Imperial Blue, **Ialmenus evagoras,** Donovan, showing the four stages in the life-history—eggs, inflated caterpillar, chrysalis, and perfect insects of both sexes. The central area on the wings of this beautiful butterfly is pale metallic blue. This insect is locally common, and generally found in numbers where it occurs. The caterpillars are found in various stages from December to March, feeding during the day on young Early Black Wattles, *Acacia decurrens,* and the Black Wattle, *Acacia mollissima,* and are always attended by a number of small black ants, probably of several species. These ants are always moving quickly, on and about the larvae. It is amazing to watch how the ants keep with the caterpillars when disturbed. Sometimes there will be a number of larvae grouped together, and if one moves away from the rest the ants are after it. A number will run on to the back of the caterpillar, holding on with their mandibles, while a number move around to head it back, and generally succeed in bringing the caterpillar to a halt after it has moved a few inches. When a caterpillar falls to the ground it is wonderful how quickly the ants on the ground find and keep with it, and when the caterpillar is touched or disturbed, by the way the ants immediately show fight, by running over the hand and nipping it with their mandibles. The majority of caterpillars have pupated by the end of January, and are found attached to small branches, and under surface of leaves of small stunted Acacias. Often

a number of pupae are found clustered together on a silken web spun by the caterpillars. The colour of the chrysalis is brown, which gradually turns a dark brown a week before the butterfly emerges. This season I made a note how long it took the butterfly to emerge from the chrysalis. Twelve full-grown larvae were secured on a small Black Wattle on 3rd February; larvae pupated from the 4th to the 10th of February; perfect insects emerged from the 2nd to the 9th of March, thus taking four weeks for the butterfly to emerge, from the time the caterpillar turned into a chrysalis. Localities where the larvae and pupae were secured, Eltham and Woori Yallock.

The eighth species is **Ialmenus icilius,** Hewitson. G. Lyell has secured larvae and pupae of this rare butterfly at Gisborne, and it also occurs in South and Western Australia. The central area on the wings of the male being metallic green, on the wings of the female metallic blue. The specimen exhibited was captured in Western Australia.

The ninth species is **Protialmenus ictinus,** Hewitson, Imperial Blue, with two stages in the life-history is exhibited, pupae and perfect insects. The caterpillars are found feeding during the day on the Black Wattle, *Acacia decurrens*, and the Blackwood, *Acacia melanoxylon*. They are always attended by the large fierce Meat Ant, *Iridomyrmex detectus*, and I well remember the first time I climbed a tree to secure some full-grown caterpillars. When the larvae were disturbed this large ant immediately attacked me, and it did not take me long to reach the ground and pull off my coat to brush off the ants that were holding on to my arms with their strong mandibles. When a caterpillar falls to the ground it is wonderful how quickly the meat ants moving about near the base of the tree find and shepherd the caterpillar. The larvae and pupae of this butterfly are found in the months of October, November, and December, the perfect insects being on the wing in the end of December and January. Localities where the larvae and pupae were secured, Broadmeadows. A. N. Burns found the larvae and pupae at Bacchus Marsh. J. E. Dixon found larvae and pupae at Kerrisdale, and W. H. A. Roger found the larvae and pupae at Trawool. This species occurs all along the eastern side of Australia and as far north as Kuranda, in Northern Queensland.

My remarks this evening may have created an interest in some of the younger members of the Club who have not yet settled down to any particular line of study. To my mind the development and life of a butterfly is a subject of deep interest. The part different species play in the economy of nature requires patient investigation, and any facts gleaned should be recorded.

The published literature on Victorian butterflies is some-

what scanty. In 1893 E. Anderson and the late F. P. Spry, both members of this Club, published "Victorian Butterflies and How to Collect Them," in which most of our species were illustrated. It is a useful book for a young beginner, but is now out of print, and difficult to obtain. In 1907 W. J. Rainbow, of the Australian Museum, Sydney, published "A Guide to the Study of Australian Butterflies," a more comprehensive work, in which were illustrated a number of life-histories of Australian butterflies. In "Australian Insects," by W. W. Froggatt, Government Entomologist of New South Wales, a number of species are illustrated, also many moths. The standard work at present on Australian butterflies is by Waterhouse and Lyell (also members of this Club), published in 1914. This is a most complete work, describing and illustrating the whole of our Australian butterflies, numbering four hundred and twenty species, also illustrating types of the larvae and pupae of the different families. In this work eighty-four species are recorded for Victoria, classified as follows:—Nymphalidae, 19, of which fourteen belong to the sub-family Satyrinae, "browns" or "forest" butterflies; Lycaenidae, "blues" and "coppers," 29; Pteridae, "whites" and "yellows," 6; Papilionidae, "swallow-tails," 4; and Hesperidae, "skippers," 26. The parts of "Destructive Insects of Victoria," by C. French, first Government Entomologist of Victoria, also contain some account of the life-histories of certain Victorian butterflies, and I am indebted to several of these authors for some of the information included in these notes.

Though not approaching the size and coloration of the more tropical species, Victorian butterflies are not without some beauty, and are well worthy of study.

Explanation of Plate.

1.—*Ogyris olane*, Hew., "Mistletoe Blue."—*a*, eggs; *b*, caterpillar; *c*, chrysalis; *d*, imago (male); *e*, imago (female); *f*, food plant (Drooping Mistletoe, *Loranthus pendulus*).

2.—*Miletus delicia delos*, "Moonlight Blue."—*a*, eggs; *b*, caterpillar; *c*, ants which attend caterpillar; *d*, chrysalis; *e*, imago (male); *f*, imago (female); *h*, food plant (Black Wattle, *Acacia mollissima*).

AN APPRECIATION.—*Nature* (London) for April 19th, 1924, says that the *Victorian Naturalist* for February, 1924, contains "a very readable account" by Mr. D. J. Paton of "a very unusual plant formation" (the Whipstick Scrub, near Bendigo), and gives brief notes on the characteristics of the vegetation.